

CLAIMS

What is claimed is:

1. A system, comprising:

5 a sealed electronics module;
one or more electronics components arranged within the sealed electronics module;
one or more connectors attached to the sealed electronics module, the connectors
configured to provide one or more detachable connections to liquid transporting apparatus, the
liquid transporting apparatus configured to provide liquid communication between the sealed
10 electronics module and an external liquid cooling module; and
a cooling apparatus arranged within the sealed electronics module that cools the one or
more electronics components using liquid that is transported between the sealed electronics
module and the external liquid cooling module.

15 2. The system of claim 1, where the sealed electronics module is configured to be included
in a scaleable electronics system.

3. The system of claim 2, where the scaleable electronics system is a computer system.

20 4. The system of claim 1, where the sealed electronics module is sealed with respect to
electromagnetic interference.

5. The system of claim 1, where the sealed electronics module is sealed with respect to one
or more of, noise, airborne contaminants, nuclear, biological, and chemical agents.

25 6. The system of claim 1, where the one or more electronics components include one or
more of, a microprocessor, a memory chip, a controller chip, and a power subsystem component.

30 7. The system of claim 1, where the sealed electronics module is configured to be operably
connected to one or more second sealed electronics modules.

8. The system of claim 1, where the sealed electronics module is configured to be detachably connected by the one or more connectors with one or more second sealed electronics modules and thus to be in liquid communication with the one or more second sealed electronics

5 modules.

9. The system of claim 1, where the liquid transporting apparatus provides liquid communication with two or more liquid cooling modules.

10 10. The system of claim 1, where the sealed electronics module is a scaleable N processor server, N being an integer.

11. The system of claim 1, where heat generated by one or more of the one or more electronics components is dissipated directly into the liquid transported between the sealed 15 electronics module and the external liquid cooling module.

12. The system of claim 1, where heat generated by one or more of the one or more electronics components is dissipated indirectly into the liquid transported between the sealed electronics module and the external liquid cooling module.

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13. The system of claim 1, comprising:
a rack configured to mount one or more sealed electronics modules;

14. The system of claim 13, where the rack is configured to mount one more liquid cooling 25 modules.

15. An apparatus, comprising:
a liquid cooling module;
one or more connectors attached to the liquid cooling module, the connectors configured 30 to provide one or more detachable connections to liquid transporting means for communicating

liquid between the liquid cooling module and a sealed electronics module after being connected to each other, the liquid cooling module being physically located external to the sealed electronics module;

means arranged within the liquid cooling module for receiving a liquid to be cooled;

5 means arranged within the liquid cooling module for cooling the liquid to be cooled into a cooled liquid;

means arranged within the liquid cooling module for providing the cooled liquid to the sealed electronics module via the liquid transporting means; and

10 means arranged within the liquid cooling module for dissipating heat transferred to the liquid cooling module from the liquid to be cooled.

16. The apparatus of claim 15, where the liquid cooling module is configured to connect to and be in liquid communication with one or more second liquid cooling modules.

15 17. The apparatus of claim 15, where the liquid cooling module is a heat exchanger.

18. The apparatus of claim 15, where the liquid cooling module is a sub-cooling element.

19. The apparatus of claim 15, where the liquid cooling module dissipates heat using 20 conditioned air.

20. The apparatus of claim 15, where the liquid cooling module dissipates heat using conditioned liquid.

25 21. A liquid cooled modular electronics system, comprising:

one or more sealed electronics modules, a sealed electronics module including:

one or more electronics components arranged within the sealed electronics module;

30 one or more connectors attached to the sealed electronics module, the connectors configured to provide one or more detachable connections between the sealed electronics

module and liquid transporting means for providing liquid communication between the sealed electronics module and one or more external liquid cooling modules; and

5 means arranged within the sealed electronics module for dissipating heat generated by one or more of the one or more electronics components using liquid that is transported between the sealed electronics module and the external liquid cooling module;

and

one or more liquid cooling modules, a liquid cooling module including:

10 one or more connectors attached to the liquid cooling module, the connectors configured to provide one or more detachable connections between the liquid cooling module and the liquid transporting means;

means arranged within the liquid cooling module for receiving a liquid to be cooled;

15 means arranged within the liquid cooling module for cooling the liquid to be cooled into a cooled liquid;

means arranged within the liquid cooling module for providing the cooled liquid to one or more sealed electronics modules via the liquid transporting means; and

means arranged within the liquid cooling module for dissipating heat transferred to the liquid cooling module from the liquid to be cooled;

20 where the one or more liquid cooling modules and the one or more sealed electronics modules are separate modules that can be selectively connected together by the one or more detachable connections to establish liquid communication therebetween.

22. The system of claim 21 where the one or more sealed electronics modules are configured 25 to be dynamically operably connected by a detachable connection to one or more second liquid cooled electronics modules.

23. The system of claim 21, where the one or more sealed electronics modules are sealed with respect to electromagnetic interference.

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24. The system of claim 21, where the one or more electronics components include one or more of, a microprocessor, a memory chip, a controller chip, and a power subsystem component.

25. The system of claim 21, where the one or more sealed electronics modules are configured 5 to be in liquid communication with one or more second sealed electronics modules via the one or more detachable connections.

26. The system of claim 21, where the electronics system is a scaleable M processor server, M being an integer.

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27. The system of claim 21, comprising:

a rack configured to mount the one or more sealed electronics modules and the one or more liquid cooling modules.

15 28. The system of claim 21, where the one or more liquid cooling modules are configured in a redundant fail-over system.

29. A method, comprising:

receiving a liquid into a sealed electronics module;

20 dissipating, into the liquid, heat generated by one or more electronics components in the electronics module; and

providing the liquid to a liquid cooling module that is detachably connected to the sealed electronics module.

25 30. The method of claim 29, where the heat generated by the one or more electronics components is dissipated directly into the liquid.

31. The method of claim 29, where the heat generated by the one or more electronics components is dissipated indirectly into the liquid.

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32. The method of claim 29, where the sealed electronics module is sealed from electromagnetic interference.

33. An apparatus, comprising:

5 means for receiving a liquid into a sealed electronics module;
means for dissipating, into the liquid, heat generated by one or more electronics components in the electronics module; and
means for providing the liquid to a liquid cooling module that is detachably connected to the sealed electronics module.

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